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Some Northwestern Erysiphaceae

By David Griffiths

The following list is prepared from material which has been accumulating since 1892. It is based upon specimens from South Dakota, Wyoming and Montana. The species recorded from the two latter States are in the nature of incidental gatherings which were made while engaged in other work during the summers of 1897 and 1898 in company with either Mr. L. W. Carter or Mr. T. A. Williams. Access has been had to the private herbarium and collections of Mr. Williams, and several hosts and one species are quoted from these collections. The list is by no means even approximately complete for the region covered. It is published simply as a preliminary list to which additions will doubtless be made when other localities are visited.

As might be expected from a knowledge of the altitudinal and climatic variations of the states mentioned, the species are exceedingly variable in both macroscopic and microscopic characters. These variations have been quite thoroughly worked out by Professor T. J. Burrill in Ellis & Everhart, N. A. Pyrenomycetes, but the variations here are in many cases still greater than recorded by either him or Dr. Rehm in Rabenhorst's Kryptogamen Flora. I find my material variable, especially in the extent of mycelial development and the usual microscopic measurements. In the matter of appendages, character of the wall of the perithecium and number of spores and asci I find less variation from published descriptions.

As to the identity of the species recorded here, there are two points regarding which there is some doubt. *Erysiphe cichoracearum* growing on *Bigelovia*, *Lygodesmia* and *Grindelia* appears to me to have some constant characters of its own. This I find to be the case in various exsiccatae which I have examined as well as in my own collections. The characteristics which appear to be the most distinctive are the abundant development of mycelium which gives a different appearance from the forms on the other composites even to the naked eye ; and the number of asci and the lighter colored appendages are also quite characteristic. *Microsphaera diffusa* and *M. Ravenelii* are quite difficult of separation, especially in the immature condition. After careful examination of well authenticated specimens named by the describers, or duplicate specimens of the type material, I have referred my specimens on *Lathyrus* to *M. Ravenelii* and the forms on *Vicia* to *M. diffusa.* Attention might be called in passing to the necessity of good descriptions of the conidial stage of the Erysiphaceae as well as of the perithecial one. Some of my material shows good characters in the early condition of development.

An interesting observation regarding the apparent sudden appearance of *E. communis* on several species of *Polygonum* is worth recording. As stated before, the collection of fungi was begun in South Dakota in 1892, but no specimens of *E. communis* were found on *Polygonum* until 1895, when I found a few immature specimens in the northern part of the state, and Mr. Williams reported it from Brookings the same year. The next year more of it was found, and in 1897 and 1898 it was abundant everywhere. The fungus without doubt occurred on species of *Polygonum* long before we happened to find it ; but that it occurred in small quantity previous to 1896 there can be no doubt.

It is interesting to compare the vertical distribution of these species. This is governed mainly, no doubt, by the habits of the hosts ; but as some of the host plants recorded here are found at a much higher altitude and others at a much lower, the question naturally arises as to the extent of altitudinal influence. The following upper limits will be instructive :

ERYSIPHE COMMUNIS on *Oenothera albicaulis*, 6500 ft.

ERYSIPHE CICHORACEARUM on *Mertensia Sibirica*, 8500 ft.

ERYSIPHE GRAMINIS on *Agropyron tenerum*, 8500 ft.

MICROSPHAERA VACCINII on *Vaccinium Myrtillus microphyllum*, 8500 ft.

SPHAEROTHECA CASTAGNEI on *Arnica cordifolia*, 9500 ft.

SPHAEROTHECA HUMULI on *Viola Canadensis*, 7500 ft.

The altitudes are all given for localities on Clear Creek in the Big Horn Mountains in the vicinity of Buffalo, Wyo., where quite a complete collection was made from the base of the mountains to the snow line, which here is located at about 10500 ft. *Sphaerotheca Castagnei* was found at the highest level on *Arnica cordifolia*. This host is very abundant here at lower altitudes, but this was the only locality in which it was found affected with this fungus.

Some attention has been paid to the distribution of the fungi on closely related hosts of the region. A study of the list will furnish the best general idea on this point. *E. cichoracearum* has been found, as usual, on a great number of hosts and in several instances widely separated ones. While its favorite habitat appears to be on the composites it is by no means confined to this group. When these facts are taken into consideration it is rather astonishing to find an entire absence of the fungus on hosts which are generically related. A striking illustration came under my observation at Sheridan, Wyo. In the corner of a garden three species of the genus *Artemisia*—*A. Ludoviciana*, *A. tridentata* and *A. longifolia* were growing in profusion. They were in such close proximity that their branches were actually intertwined. Being in partially cultivated ground the growth of each was much more luxuriant than usual. *A. Ludoviciana* was loaded with *E. cichoracearum*, but careful search failed to reveal any on the other two species. I am not aware that the fungus has ever been recorded on either of these two species. This is all the more astonishing when we consider the frequency with which *A. Ludoviciana* is affected. In the absence of direct experimental evidence no positive reason can be given for the absence of this fungus on the two species in question under such apparently favorable conditions. Although closely related there is, however, a great difference in the aromatic principle and the development of trichomes in the two species, which may account for the phenomenon at least in part. A parallel case was observed in two other species of the same genus at Buffalo, Wyo. *A. dracunculoides* and *A. Canadensis* were growing together. The former had an abundance of *E. cichoracearum* upon it while the latter was entirely free. A directly opposite effect even in widely separated hosts was observed at Missoula, Mont. Here *Crataegus* and *Alnus* were growing so that the branches overlapped. The former was badly affected with *Phyllactinia suffulta* and the latter with *Microsphaera alni*. A small quantity of *P. suffulta* was found on the *Alnus* also.

ERYSIPHE CICHORACEARUM DC.

On *Verbena stricta* Vent., Oakwood, S. D.
Artemisia Ludoviciana Nutt., Missoula, Mont.; Aberdeen, S. D.; Sheridan, Wyo. ; Ft. McKinney, Wyo.
Artemisia dracunculoides Pursh, Pierre, S. D.; Billings, Mont.; Buffalo, Wyo.
Achillea millefolium L., Sylvan Lake, S. D.
Boltonia asteroides L'Her., Aberdeen, S. D.
Rudbeckia hirta L., Sylvan Lake, S. D.
Ambrosia trifida L., Pierre, S. D.
Ambrosia psilostachya DC., Huron, S. D.; Billings, Mont.
Bigelovia graveolens albicaulis Gray, Merino, Wyo.; Ft. McKinney, Wyo.
Solidago nana Nutt., Inyan Kara Mt., Wyo.
Solidago Canadensis L., Tacoma Park, S. D.
Helianthus rigidus Desf., Aberdeen, S. D.
Helianthus annuus L., Missoula, Mont.
Helianthus tuberosus L., Redfield, S. D.
Helianthus giganteus L., Big Horn, Wyo.
Helianthus Maximilianus Schard., Aberdeen, S. D.
Hydrophyllum Virginicum L., Big Stone Lake, S. D.
Aster laevis L., Missoula, Mont.
Chrysopsis villosa Nutt., Buffalo, Wyo.
Helenium montanum Nutt., Missoula, Mont.
Mertensia Sibirica Don., Buffalo, Wyo.
Phacelia circinata Jacq., Missoula, Mont.
Galium triflorum Michx., Missoula, Mont.
Carduus altissimus L., Ft. McKinney, Wyo.
Grindelia squarrosa Donal, "L. A. K." Ranch, S. D.; Aberdeen, S. D.; Ft. McKinney, Wyo.
Balsamorrhiza sagittata Nutt., Buffalo, Wyo.
Macrocalyx nyctalea (L.) Kuntze, Big Stone Lake, S. D.
Lygodesmia juncea Don., Buffalo, Wyo.
Erigeron macranthus Nutt., Bear Lodge Mts., Wyo.

ERYSIPHE COMMUNIS (Wallr.) Fr.

On *Polygonum ramosissimum prolificum* Small, Rapid City, S. D.
Polygonum ramosissimum Michx., Rapid City, S. D.; Pierre, S. D.; Billings, Mont.

Polygonum littorale Link., Grindstone Buttes, S. D.
Polygonum aviculare L., Buffalo, Wyo.; Rapid City, S. D.
Lupinus sericeus Pursh, Inyan Kara Mt., Wyo.
Thalictrum purpurascens L., Tacoma Park, S. D.
Spiesia Lamberti (Pursh) Kuntze, Grindstone Buttes, S. D.; Buffalo, Wyo.
Ranunculus Pennsylvanica L., Little Mo. Buttes, Wyo.
Homalobus cespitosus Nutt., Inyan Kara Mt., Wyo.
Lotus Purshiana (Nutt.) Bisch., Belle Foursche, S. D.
Oenothera albicaulis Nutt., Buffalo, Wyo.
Trifolium varigatum Nutt., Lo Lo, Mont.
Psoralea tenuiflora Pursh, Billings, Mont.
Astragulus oroboides Americanus Gray, Buffalo, Wyo.
Astragulus frigidus Americanus (Hook.) Watson, Buffalo, Wyo.
Astragalus Canadensis L., Tacoma Park, S. D.
Lespedeza striata Hook. & Arn., Brookings, S. D.

ERYSIPHE GALEOPSIDIS DC.

On *Stachys palustris* L., Missoula, Mont.; Aberdeen, S. D.; Ft. McKinney, Wyo.; Huron, S. D.

ERYSIPHE GRAMINIS DC.

Poa nemoralis L., Bear Lodge Mts., Wyo.; Hot Springs, S. D. Lake Hendricks, S. D.
Poa serotina Ehr., Missoula, Mont.
Poa pratensis L., Ft. McKinney, Wyo.; Brookings, S. D.
Bromus unioloides Willd., Brookings, S. D.
Bromus breviaristatus (Hook.) Buckl., Buffalo, Wyo.; Missoula, Mont.
Agropyron tenerum Vasey, Buffalo, Wyo.
Beckmannia erucaeformis Hort., Belle Foursche, S. D.

SPHAEROTHECA CASTAGNEI Lev.

On *Lepargyraea argentea* (Nutt.) Greene, Sheridan, Wyo.; Devil's Tower, Wyo.
Lepargyraea Canadensis (L.) Greene, S. Fork Piney River, Wyo.
Troximon officinalis Weber, Billings, Mont.
Crepis runcinata T. & G., Buffalo, Wyo.
Arnica cordifolia Hook., Buffalo, Wyo.

Gillardia aristata Pursh, Missoula, Mont.
Troximon glaucum Pursh, Buffalo, Wyo.; Red Lodge, Mont.
Pedicularis Groenlandica Retz., Buffalo, Wyo.
Fragaria glauca (Watson) Rydb., Missoula, Mont.
Collomia linearis Nutt., S. Fork Piney River, Wyo.
Senecio triangularis Hook., Red Lodge, Mont.
Lophanthus anisatus Benth., Little, Mo.; Buttes, Wyo.
Bidens frondosa L., Scatterwood, S. D.

SPHAEROTHECA HUMULI (DC.) Burrill

On *Viola Canadensis* L., Buffalo, Wyo.
Geranium Richardsoni Fisch., Bear Lodge Mts., Wyo.
Humulus Lupulus L., Buffalo, Wyo.

SPHAEROTHECA EPILOBII (Link.) DeB.

On *Epilobium adenocaulon* Hausskn., Sylvan Lake, S. D.; Buffalo, Wyo.

SPHAEROTHECA MORS-UVAE (Schw.) B. & C.

On *Ribes lacustre* Prior., Buffalo, Wyo.
Ribes Hudsonianum Richards, Missoula, Mont.
Ribes floridum L'Her., Rondell, S. D.

SPHAEROTHECA PANNOSA (Wallr.) Fr.

On *Rosa Woodsii* Lindl., Ft. McKinney, Wyo.

PODOSPHAERA OXYACANTHAE (DC.) DeB.

On *Spiraea lucida* Dougl., S. Fork Piney River, Wyo.
Prunus Americana Marshall, Redfield, S. D.
Prunus Virginiana L., Bigstone Lake, S. D.
Prunus demissa Walp., S. Fork Piney River, Wyo.
Prunus pumila L., Brookings, S. D.
Crataegus rivularis Nutt., Little, Mo.; Buttes, Wyo.

PHYLLACTINIA SUFFULTA (Reb.) Sacc.

On *Philadelphus Lewisii* Pursh, Missoula, Mont.
Betula occidentalis Hook., Ft. McKinney, Wyo.
Crataegus rivularis Nutt., Missoula, Mont.
Cornus stolonifera Michx., Missoula, Mont.; Big Stone Lake, S. D.

Alnus incana virescens Watson, Missoula, Mont.
Negundo aceroides Moench., Brookings, S. D.
Fraxinus viridis Michx., Brookings, S. D.
Celastrus scandens L., Brookings, S. D.

MICROSPHAERA SYMPHORICARPI E. C. Howe

On *Symphoricarpos occidentalis* Hook., Tacoma Park, S. D.
Symphoricarpos racemosus Michx., Missoula, Mont.

MICROSPHAERA VACCINII C. & P.

On *Vaccinium Myrtillus microphyllum* Hook., Buffalo, Wyo.

MICROSPHAERA ALNI (DC.) Wint.

On *Syringa vulgaris* L., Brookings, S. D.
Euonymus atropurpureus Jacq., Brookings, S. D.
Alnus incana virescens Watson, Missoula, Mont.
Lonicera glaucescens Rydb., Bear Lodge Mts., Wyo.

MICROSPHAERA QUERCINA (Schw.) Burrill

On *Quercus macrocarpa* Michx., Little, Mo.; Buttes, Wyo.

MICROSPHAERA DIFFUSA C. & P.

On *Vicia Americana truncata* (Nutt.) Brewer, Snoma, S. D.
Vicia linearis (Nutt.) Greene, Brookings, S. D.
Vicia Americana Muhl., Buffalo, Wyo.
Glycyrrhiza lepidota Pursh, Little Mo. Buttes, Wyo.

MICROSPHAERA RAVENELII Berk.

On *Lathyrus vinosus* Muhl., Sylvan Lake, S. D ; Bear Lodge Mts., Wyo.

UNCINULA SALICIS (DC.) Wint.

On *Salix cordata* Muhl., Aberdeen, S. D.
Salix sp., Little Mo. Buttes, Wyo.
Populus tremuloides Michx., Sylvan Lake, S. D.; Red Lodge, Mont.
Populus balsamifera L., Buffalo, Wyo.

UNCINULA MACROSPORA Peck.

On *Ulmus Americana* L., Brookings, S. D.

UNCINULA NECATOR (Schw.) Burrill.

On *Parthenocissus quinquefolia* (L.) Planch, Brookings, S. D.

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